

PG-393

MPHY-24

**M.Sc. DEGREE EXAMINATION –
JUNE 2019.**

Second Year

Physics

LASER AND FIBRE OPTICS

Time : 3 hours

Maximum marks : 75

PART A — (5 × 3 = 15 marks)

Answer any FIVE questions.

All questions carry equal marks.

1. What is meant by pumping action and population inversion?
2. Define magneto optic effect.
3. Define acceptance angle.
4. What is modulation?
5. What is an LED display?

6. What are Einstein's coefficients?
7. Mention few applications of LEDs.
8. Give examples of few electro optic materials.

PART A — (5 × 12 = 60 marks)

Answer ALL questions, choosing either (a) or (b).

9. (a) Write short notes on
 - (i) Mode locking
 - (ii) Q-switching.

Or

 - (b) Give the details of the contraction and working of CO₂ laser with its models of vibration.
10. (a) Explain double refraction at a boundary of a solid.

Or

 - (b) Explain reflection and refraction at the boundary of an absorbing medium of a solid.
11. (a) Explain the propagation of light through an optical fibre.

Or

 - (b) Explain fiber Fabrication Techniques.

12. (a) Explain briefly about distributed feedback laser.

Or

(b) Write short notes on

(i) Gain guided injection laser.

(ii) Quantum Well lasers.

13. (a) Explain the architecture and working of plasma panel display.

Or

(b) What are liquid crystals? Explain chemical properties of it.

PG-395

MCHE-11

M.Sc. DEGREE EXAMINATION –
JUNE 2019.

First Year

Chemistry

ORGANIC CHEMISTRY - I

Time : 3 hours

Maximum marks : 75

PART A — (3 × 5 = 15 marks)

Answer any THREE questions.

1. Discuss in detail about ozonolysis reaction.
2. Write a note on Neighbouring Group Participation (NGP).
3. What are diastereomers? Explain with suitable example.
4. Define the following terms : Synthons, Synthetic Equivalent and Target Molecules.
5. Describe about aromaticity in heteroaromatic molecules?

PART B — (5 × 12 = 60 marks)

Answer ALL questions.

6. (a) Explain the following reactions :

(i) Benzoin condensation

(ii) Reformatsky reaction

Or

(b) Define : Elimination reactions. Explain the mechanism of E₁ and E_{1c} B reaction with suitable examples.

7. (a) Discuss the following reactions :

(i) Wagner-Meerwein rearrangement

(ii) Dienone-phenol rearrangement

(iii) Ullmann reaction.

Or

(b) Discuss in detail about Hammett equation and Taft equation.

8. (a) What is optical activity? How it can be measured? How will you determine the optical purity of the sample?

Or

(b) Discuss the chirality exhibited by allenes, spiranes and biphenyls with suitable examples.

9. (a) Explain the protection and deprotection strategies of functional groups in organic synthesis.

Or

- (b) Discuss the preparation, mechanism and applications of Wilkinson's catalyst.

10. (a) Illustrate the aromatic behavior of non-benzenoid aromatic compounds.

Or

- (b) Explain about Electron occupancy in MO's and aromaticity.
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PG-396

MCHE-12

M.Sc. DEGREE EXAMINATION –
JUNE 2019.

First Year

INORGANIC CHEMISTRY – I

Time : 3 hours

Maximum marks : 75

PART A — (3 × 5 = 15 marks)

Answer any THREE questions.

1. Define bond length, bond order and bond energy.
2. What is chelate effect? Explain with an examples.
3. Explain the term symbiosis with suitable examples.
4. What are complementary and non-complementary reactions? Give one example for each reaction
5. Derive the term symbol for :
 - (a) Gd^{3+}
 - (b) Ce^{4+} .

PART B — (5 × 12 = 60 marks)

Answer ALL questions.

6. (a) Identify the hybridization and shape of the following molecules.
- (i) XeF_2
 - (ii) XeO_2F_2
 - (iii) XeOF_4
 - (iv) XeF_6
 - (v) SF_4
 - (vi) ClF_3

Or

- (b) (i) Define lattice energy
- (ii) Derive Born-Landé and Born-Meyer equations.

7. (a) (i) Explain crystal field splitting of d- orbitals in octahedral field with neat diagrams.
- (ii) Discuss the factors affecting crystal field splitting.

Or

- (b) (i) What is Jahn-Teller distortion? Explain with two examples.
- (ii) Sketch the Orgel diagram and write the possible transitions for the weak field cases of d^3 , d^6 and d^7 configurations.

8. (a) Discuss the geometrical isomerism and optical isomerism in six coordinated complexes.

Or

- (b) (i) Write notes on hard and soft ligands.
(ii) Explain the determination of absolute configuration of complexes by ORD and CD methods.

9. (a) What is trans effect? Explain the theories of trans effect.

Or

- (b) Write the characteristics of inner sphere and outer sphere mechanisms. Explain these mechanisms with suitable examples.

10. (a) (i) Compare the characteristics of lanthanides and actinides.

- (ii) Write notes on lanthanide shift reagents.

Or

- (b) (i) What is lanthanide contraction? Explain its consequences.

- (ii) Write a short note on magnetic property of lanthanides.
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PG – 397

MCHE-13

M.Sc. DEGREE EXAMINATION – JUNE 2019.

First Year

Chemistry

PHYSICAL CHEMISTRY - I

Time : 3 hours

Maximum marks : 75

PART A — (3 × 5 = 15 marks)

Answer any THREE questions.

1. Discuss the entropy changes in reversible and irreversible processes. (5)
2. (a) Write down the general form Schrodinger's wave equation and give the physical significance of ψ and ψ^2 . (3)
(b) What are eigen functions? Give an example. (2)
3. Explain kinetic isotopic effects with suitable examples. (5)

4. Define the following terms:
- (a) Eutectic point
 - (b) Triple point
 - (c) Congruent melting point
 - (d) Transition point
 - (e) Meta stable equilibrium (5)
5. Derive Debye-Huckel limiting law. Give the applications of this equation. (5)

PART B — (5 × 12 = 60 marks)

Answer ALL questions.

6. (a) (i) Calculate the free energy change for the reaction, $\text{CO}_{(g)} + \text{H}_2\text{O}_{(g)} \rightarrow \text{CO}_{2(g)} + \text{H}_2_{(g)}$ at 27°C and predict the reaction will be spontaneous at this temperature.
- ($\Delta H = -9830$ cal and $\Delta S = -10.140$ cal/deg/mol). (3)
- (ii) Derive Gibbs- Duhem equation. How does chemical potential vary with temperature and pressure? (9)

Or

(b) (i) What do you understand by the term Fugacity? How is the fugacity of the real gas determined? (8)

(ii) Calculate the free energy change accompanying the compression of 1 mole of a gas 65°C from 25 to 200 atmospheres. The fugacities of the gas may be taken as 65°C from 23 and 91 atmospheres respectively, at pressures of 25 and 200 atmospheres. (4)

7. (a) (i) State Born-Oppenheimer approximation. (3)

(ii) Derive wave equation and energy for Simple harmonic oscillator. (9)

Or

(b) (i) Define photoelectric effect. (2)

(ii) Solve the Schrodinger wave equation for a particle in a one-dimensional box and find the expression for the energy. (10)

8. (a) (i) Discuss Lindeman's theory of unimolecular reactions. (8)
- (ii) Can the activation energy of a reaction be zero or negative? Justify. (4)

Or

- (b) (i) Define rate constant for a reaction. (2)
- (ii) A substance reacts according to first order rate law and the specific rate of the reaction is $1 \times 10^{-2} \text{ s}^{-1}$. If the initial concentration is 1.0M,
- (1) What is the initial rate?
- (2) What is the reaction rate after 1 minute? (4)
- (iii) Explain the collision theory of bimolecular reaction. (6)

9. (a) (i) Write different types of phase transitions. Illustrate the phase behaviour of solid- liquid with suitable example. (9)
- (ii) Write the limitations of phase rule. (3)

Or

- (b) (i) Discuss the application of phase rule to a three component system with suitable example. (7)
- (ii) State Phase rule. Discuss the derivation of the phase rule from thermodynamic consideration. (5)
10. (a) (i) Discuss the Stern model of electrical double layer. Mention the conditions at which it approaches Gouy and Helmholtz model. (8)
- (ii) The density of 0.1 M solution of KI in CCl_4 at 20°C is 0.8014. Calculate the ratio of the activity coefficients γ and f . ($K = 39, I = 127$) (4)

Or

- (b) (i) Derive Butler - Volmer equation. How does this equation get modified at lower over potential? (8)
- (ii) Define activity and activity coefficients. (4)
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PG – 398

MCHE – 14

M.Sc. DEGREE EXAMINATION – JUNE 2019.

First Year

Chemistry

**ANALYTICAL AND ENVIRONMENTAL
CHEMISTRY**

Time : 3 hours

Maximum marks : 75

PART A — (3 × 5 = 15 marks)

Answer any THREE questions.

1. Explain the basic principle of NMR spectroscopy.
2. What is Fermi resonance? Explain
3. Define the terms: parent ion, metastable ion and base peak.
4. Explain alpha halo keto rule with an example.
5. Write notes on Coulometric titrations.

PART B — (5 × 12 = 60 marks)

Answer ALL questions.

6. (a) (i) Compare ^1H -NMR and ^{13}C -NMR.
- (ii) Explain off-resonance and noise decouple ^{13}C -NMR spectrum with an example.

Or

- (b) What is chemical shift? Explain the factors affecting chemical shift.

7. (a) (i) Write notes on sampling technique in IR spectroscopy.
- (ii) How will you distinguish infra and intermolecular hydrogen bonding with the help of IR spectroscopy.

Or

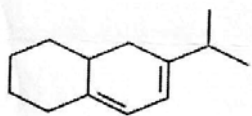
- (b) How many normal modes of vibrations are possible for CO_2 and H_2O ? Sketch the stretching and bending modes of these molecules and indicate IR active and IR inactive modes.

8. (a) (i) Explain the general rules of fragmentations in mass spectrometry.
(ii) Explain Retro-Diels alder reaction with an example.

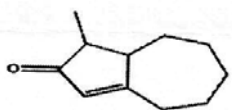
Or

- (b) Using Woodward-Fieser's rule, calculate λ_{max} for following compounds.

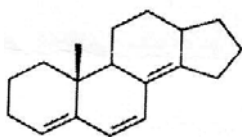
(i)



(ii)



(iii)



9. (a) Write notes on
(i) types of ORD curves
(ii) Applications of cotton effect curves

Or

- (b) Explain the principle and applications of HPLC.

10. (a) Write notes on
- (i) Conductometric titrations
 - (ii) Principles of cyclic voltammetry

Or

- (b) Discuss the instrumentation and applications of TGA.
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PG-399

MCHE-15

M.Sc. DEGREE EXAMINATION –
JUNE 2019.

First Year

**CHEMISTRY OF BIO-MOLECULES AND GREEN
CHEMISTRY**

Time : 3 hours

Maximum marks : 75

PART A — (3 × 5 = 15 marks)

Answer any THREE questions.

1. How are enzymes classified? Explain the mechanism of enzyme action. (5)
2. Define Vitamins and Hormones. Differentiate between vitamins and hormones. (5)
3. (a) What are the different types of fertilizers? Give an example for each one. (2)
(b) Define petrochemicals and how they are classified? (3)
4. Write the synthesis of Morphine. (5)
5. Discuss the biocatalysts with suitable examples. (5)

PART B — (5 × 12 = 60 marks)

Answer ALL questions.

6. (a) (i) Explain Edman's method of N-terminal and C-terminal analysis of proteins. (8)
- (ii) Compare and contrast between DNA and RNA. (4)

Or

- (b) (i) Discuss the structure of DNA. (6)
- (ii) Explain the various factors affecting the enzyme activity. (4)
- (iii) Distinguish between co-enzyme and apo-enzyme. (2)
7. (a) Discuss the structure, stereochemistry and synthesis of PGEL. (12)

Or

- (b) (i) How are carbohydrates classified? (3)
- (ii) Write the sources and diseases caused by deficiency of vitamins A, B-complex, C, D, E and K. (9)

8. (a) (i) What are pesticides? How are they classified? Give the advantages and disadvantages of using pesticides. (6)
- (ii) Define the following terms:
- (1) Antipyretics
 - (2) Anti-inflammatory
 - (3) Synthetic gasoline (6)

Or

- (b) (i) Explain the theories of origin of petroleum. (7)
- (ii) Discuss the preparation and applications of chemical fertilizers with suitable examples. (5)
9. (a) (i) State isoprene rule. Give an example. (2)
- (ii) Give a complete synthesis of estrone. (10)

Or

- (b) (i) Explain the position and nature of side chain in cholesterol. (4)
- (ii) Write the bio synthesis of α - Terpenol with mechanism. (8)

10. (a) (i) Write a short note on the following
(1) Reactions in ionic liquids
(2) Phase transfer catalyst. (6)
- (ii) Discuss the effects of toxicity on humans and wild life. (4)
- (iii) Highlight the importance for the need of green chemistry. (2)

Or

- (b) (i) Give twelve principles of green chemistry. (6)
- (ii) Explain the green chemical synthesis of Ibuprofen. (4)
- (iii) Write the applications of green chemistry. (2)
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PG-400

MCHE-16

M.Sc. DEGREE EXAMINATION –
JUNE 2019.

First Year

Chemistry

POLYMER CHEMISTRY

Time : 3 hours

Maximum marks : 75

SECTION A — (3 × 5 = 15 marks)

Answer any THREE questions.

1. Discuss in detail about chain growth polymerization.
2. Write a note on stereoregular polymers.
3. Discuss the glass transition temperature. (T_g).
4. How will you measured the viscosity of a polymer solution using Ostwald method?
5. What are electrically conducting polymers? Give example and mention its uses.

SECTION B — (5 × 12 = 60 marks)

Answer ALL questions.

6. (a) How the polymers are classified on the basis of their structure?

Or

- (b) What are the advantages and disadvantages of Emulsion, Mass and Solution polymerization methods?

7. (a) What is coordination polymerization? Explain the mechanism of Ziegler-Natta Catalyst with suitable example.

Or

- (b) Explain the isomerism in mono d-substituted ethylene polymers.

8. (a) Write an essay about the morphology and order in crystalline polymers.

Or

- (b) Discuss the following :
- (i) Crystal structures of polymers
 - (ii) Configurations of polymer chains.

9. (a) What is Number Average Molecular Weight (M_n)? How it can be calculated by different methods?

Or

- (b) Discuss the applications of IR and ESR spectroscopy in polymer analysis.
10. (a) Write Any ONE method of production of the following compounds and mention its uses :
- (i) Polyvinyl chloride
 - (ii) Polyamides
 - (iii) Polyesters.

Or

- (b) Write a short note on the following :
- (i) Biodegradable Polymers
 - (ii) Polymer composites.
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